AMENDMENTS TO THE CLAIMS

Please amend claims 1 and 111 as follows:

1. (Four Times Amended) A [modified] concentric spectrograph comprising:

a diffraction grating having an optical axis, a meridian plane, [and] a grating concave surface and a set of grating grooves on said concave surface, said grating grooves generally extending in a groove direction, and said meridian plane [having a first side and a second side] containing the grating optical axis and extending transversely to the grating grooves;

a field lens having a [substantially] lens convex surface and a relatively planar lens surface, said relatively planar lens surface being relatively planar relative to the shape of said lens [a] convex surface, and a lens [an] optical axis, wherein said lens convex surface [is facing] faces and is substantially concentric with said grating concave surface, said optical axes of said grating and said lens being substantially [coaxial] coincident and said relatively planar lens surface extending transversely to said lens optical axis;

an [a primary] entrance port [being located substantially out of said meridian plane toward said first side] positioned to introduce incident polychromatic light to the relatively planar lens surface at a location on said relatively planar lens surface on one side of said meridian plane; and

an [a primary] exit port [being] located [substantially out of said meridian plane toward said second side for receiving an order of light that maximizes throughput and minimizes astigmatism] to receive a non-zero order of diffracted light emerging from said lens planar surface at a location on the other side of the meridian plane from the incident polychromatic light, without significant mixing with adjacent orders of diffracted light.

98. (Amended) A concentric spectrograph according to claim 1 wherein the grating concave surface and the field lens convex surface are spherical wherein the ratio of the radius of curvature of the convex lens to the radius of curvature of the grating concave surface is roughly about 0.4:1 and wherein the spacing between the convex lens surface and the grating concave surface is roughly about 0.6 times the grating radius of curvature.

111. (Amended) A spectrograph comprising:

a grating having an optical axis, a meridian plane, and a concave surface, said meridian plane having a first side and a second side;

a lens having a substantially planar surface, a convex surface, and an optical axis, wherein said convex surface is facing said concave surface, said optical axes being substantially coaxial or parallel to each other;

a primary entrance port being located substantially out of said meridian plane toward said first side; and

a primary exit port being located substantially out of said meridian plane toward~~,~~ said second side for receiving an order of light that maximizes throughput and minimizes astigmatism.

Please add claims 121-130 as follows:

121. (New) A concentric spectrograph as in claim 1, wherein said exit port is positioned to receive a first-order image.

122. (New) A concentric spectrograph as in claim 1, wherein said exit port is positioned to receive a negative first-order image.

123. (New) A concentric spectrograph as in claim 1, wherein said entrance and exit ports are positioned proximate the focal plane of the spectrograph.

124. (New) A concentric spectrograph as in claim 1, wherein said entrance and exit ports are positioned relative to said lens convex surface and said grating concave surface to reflect light which is reflected by said lens convex surface

towards said grating concave surface for reflection generally towards said lens convex surface to follow a path which avoids said exit port.

125. (New) A concentric spectrograph comprising:

a diffraction grating having an optical axis, a meridian plane, a grating concave surface and a set of grating grooves on said concave surface, said grating grooves generally extending in a groove direction, and said meridian plane containing the grating optical axis and extending transversely to the grating grooves;

a field lens having a lens convex surface, a relatively planar lens surface, said relatively planar lens surface being relatively planar relative to the shape of said, lens convex surface, and a lens optical axis, wherein said lens convex surface faces and is substantially concentric with said grating concave surface, said optical axes of said grating and said lens being substantially coincident and said relatively planar lens surface extending transversely to said lens optical axis;

an entrance port positioned to introduce incident polychromatic light to the relatively planar lens surface at a location on said relatively planar lens surface on one side of said meridian plane; and

an exit port located to receive diffracted light emerging from said lens planar surface at a location on the other side of the meridian plane from the

incident polychromatic light, said entrance and exit ports being positioned relative to said lens convex surface and said grating concave surface to reflect light which is reflected by said lens convex surface towards said grating concave surface for reflection generally towards said lens convex surface to follow a path which avoids said exit port.

126. (New) A spectrograph as in claim 111, wherein said optical axes are parallel to and offset from each other.

127. (New) A spectrograph as in claim 111, wherein said lens is spherical.

128. (New) A concentric spectrograph comprising:

a diffraction grating having an optical axis, a meridian plane, a grating concave surface and a set of grating grooves on said concave surface, said grating grooves generally extending in a groove direction, and said meridian plane containing the grating optical axis and extending transversely to the grating grooves;

a field lens having a lens convex surface, a relatively planar lens surface, said relatively planar lens surface being relatively planar relative to the shape of said lens convex surface, and a lens optical axis, wherein said optical axes of said

grating and said lens substantially coincide and said relatively planar lens surface extends transversely to said lens optical axis;

an entrance port positioned to introduce incident polychromatic light to the relatively planar lens surface at a location on said-relatively planar lens surface on one side of said meridian plane; and

an exit port located to receive a non-zero order of diffracted light emerging from said lens planar surface at a location on the other side of the meridian plane from the incident polychromatic light, and, overall, to tend to maximize throughput and tend to minimize astigmatism.

129. (New) A concentric spectrograph comprising:

a diffraction grating having an optical axis, a meridian plane, a grating concave surface and a set of grating grooves on said concave surface, said meridian plane containing the grating optical axis and extending transversely to the grating grooves;

a lens having a lens convex surface, a relatively planar lens surface, said relatively planar lens surface being relatively planar relative to the shape of said lens convex surface, and a lens optical axis;

an entrance port positioned to introduce incident polychromatic light to the relatively planar lens surface at a location on said-relatively planar lens surface on one side of said meridian plane; and

an exit port located to receive first order of diffracted light emerging from said lens planar surface at a location on the other side of the meridian plane from the incident polychromatic light.

130. (New) A concentric spectrograph as in claim 129, wherein said exit and entrance ports are on opposite sides of a second plane which is both i) perpendicular to said meridian plane and ii) passes through said optical axis of said grating.